Proposal for a “Physics Analysis and Workshop Centre” at DESY

Author: Thomas Schörner-Sadenius
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Introduction

The Analysis Centre formed an integral part of the Helmholtz Alliance “Physics at the Terascale”, specifically of the research topic “Analysis”. It had the broadly defined tasks of assisting the data-analysis community at the LHC and the ILC in matters of general interest, to contribute to the education and training in relevant fields and to help shape the Alliance community and improve its collaboration and communication.

The approach chosen comprised a strong programme of education events, a smaller number of carefully selected “Analysis Working Groups” and the definition of 3 (later 4) groups concentrating on very generic topics. The education programme works well, the experience with the Analysis Working Groups is mixed, and the 4 Analysis Centre groups provided valuable contributions but failed to live up to some of the more global expectations. In particular they did not succeed in becoming the accepted and sufficiently well staffed service / support centres of excellence.

With the chance opening up to participate in the Helmholtz Portfolio process, also the structures suited for the new project have to be reconsidered. In doing so, we suggest a new “Physics Analysis and Workshop Centre” (PAW-C) at DESY as a central Portfolio topic node.
The challenge for this centre will be to

- provide services that are both useful to the community and competitive in the global endeavours of the LHC and ILC and to
- find topics which qualify as being sufficiently “new” from the point of view of HGF.

On the following pages, the proposed structure and content of the new centre will be described.

Assumptions

The proposal for a new “Physics Analysis and Workshop Centre” (replacing / evolving the idea of the former Analysis Centre while building on its experience and key assets) is based on the following insights:

- The coming 5-10 years will be dominated by the analysis and interpretation of the LHC data. This has strong implications for the topics a centre will have to concentrate on, and its principles of operation.

- Only a close collaboration between experimentalists and theorists on the one hand side and between collaborators from different LHC experiments on the other will allow the maximum to be learned from the LHC and the German contributions to the projects to be maximised.

  However, equally important is the combination of information from different accelerator projects, be it – for example – the full exploitation of the HERA data for the best proton PDFs or the combination of LHC data and those from a future linear collider for the precise determination of the details of the “new physics” to be found by the LHC.

- Even when assuming a network of institutes sharing their competencies for everybody’s benefit, a strong central node at DESY with sufficient DESY manpower and other DESY resources behind it is indispensable.

- Many activities – and on the long run practically all activities of major importance for the community – will be centered at CERN, and in most cases a direct competition with CERN-based activities is not realistic.

- The education and training aspect is one of the great successes of the Helmholtz Alliance. With about 8 schools and 5 or more workshops of different size per year, together attracting around 500 people, the events organised by the Analysis Centre have a significant and visible impact on the community which is very well received.

Problems of the Analysis Centre

Despite its undeniable successes, the Analysis Centre of the Terascale Alliance is suffering from a number of conceptual or organisational shortcomings:

- The claim / promise of the Analysis Centre working groups (MC, Statistics Tools, PDFs, and partly also SUSY&BSM parameter fitting) to cover the breadth of their respective topics and to become “centres of excellence” or support / service centres for the whole Alliance community was not realistic. This is mainly due to the large variety of highly specialised problems and tools in each of the topics, and also to the very limited amount of manpower which in most projects is under-critical.

- The attraction of manpower from the universities for Alliance project of a general or support character is difficult. Moreover, the university expectations towards DESY were repeatedly disappointed. Finally, the additional manpower created in the Alliance fellowship programme basically was soaked up in the local institutes and in the experiments with little connection to Alliance structures or readiness to contribute to new larger-scale Alliance projects.

- With 4 0.5 FTE positions in the centre and no strict rules for further DESY engagements, the centre at DESY is neither able to contribute significantly to the chosen topics, nor can it fulfill its task concerning documentation, organisation, information, attractive web pages etc.

- In the competition for manpower at DESY (especially fellows) the Analysis Centre is not well placed. Fellows typically select 2 larger projects within an experimental group. There is – as a consequence – mostly no time for additional projects, and furthermore the rather generic, experiment-independent character of the projects does not appeal to many potential candidates; this is even more so the case after the startup of the LHC and the influx of data. In a sense there is a conflict between the wish of the DESY experimental groups to have impact in terms of paper publications and the claim of DESY / the Analysis Centre to provide service and support functionalities.

- The requirement of strict independence from either of the LHC experiments severely limits the activities of the Centre and is a further complication for attracting new manpower.

- DESY – with its relative vicinity to CERN and its location in the same time zone as Geneva – is not the place to which people will come naturally.

- There is a feeling in the community that lately too many levels of administration and reporting require too much attention and time. This is perceived as artifical and as contrary to the spirit in which HEP has been organised and running for a long time already. Especially the “ad hoc” definition of topics to be supported, and also the continuous call for increased collaboration raise objections.

The new structure

Against the above-mentioned problems and shortcomings of the Analysis Centre and its design and setup, we set a new structure with new possibilities. The Physics Analysis and Workshop Centre at DESY will consist of two parts:

- A “Workshop and Training Centre” will centrally organise or support all schools and workshops of all research directions in the Portfolio topic. It will also organise the LHC Physics Centre seminar series combining the former Analysis Centre and the VTI seminars.

- A “Physics (and) Analysis Centre” will bundle theoretical, phenomenological, experimental and technical projects over the Alliance. It will become a platform for exchange and for organisational and financial support. It is also the place where – for prioritized topics – additional manpower will be employed.

With this structure, the idea of a general support/service centre or centre of excellence for broad topics (like for example MC or Statistics Tools) is dropped in favour of a flexible approach which supports projects driven by up-to-date questions and problems at the LHC and elsewhere.

This approach takes into account the typical organising principle of physicists in HEP and the experience from the past that the building of large working groups with sufficient support from the universities is difficult. It therefore leaves the initiative for activities to a large extent to the community, merely offering support in terms of organisation, finances and manpower.
Of course, with the necessary resources at hand, the centre is also free to define interesting topics and start new initiatives by itself.

With the possibility of short-term support in terms of manpower and other resources (money, CPU, local expertise in the Alliance etc.) and using the high involvement of the German community in the LHC experiments, it will be possible to achieve significant, highly visible contributions to the exploitation of the LHC data which will then feed back into the work in the LHC experimental collaborations.

International collaboration

An important aspect of the new centre will be its close collaboration with the LHC Physics Centres at other locations (CERN, FermiLab, Argonne, maybe later also in Asia). The successful joint organisation of the “SM Benchmark Processes” workshop at FNAL in November 2010 shows that all centres are prepared to collaborate both in the discussion of results and – where possible – also in practical work.

A further step in this direction might be to build up closer connections to partner institutions to which DESY historically has close ties, like for example in the scandinavian countries, in Benelux or in Poland. Informal discussions with people from these regions could start soon.

Future projects (examples)

Concrete projects for the Physics Analysis and Workshop Centre @ DESY should be driven by the scientific interest and by the possibility to achieve maximum impact. Below a few possibilities are listed – keeping in mind that only projects with sufficiently strong manpower from DESY and other institutes have a chance to survive “on the market” of global HEP.

- A “PDF platform” which – in the form of a tool box – provides and supports the necessary tools for PDF determinations. It is built on the experience of the HERA experiments (HERA-PDF) and of the Zeuthen theory colleagues (ABKM PDF).
- HERWIG++ development: ...
- CASCADE development: The CASCADE MC generator was developed by DESY colleagues and was one of the major projects worked on in the framework of the MC group of the Analysis Centre.
- Proffit development and usage: ...
- A new parton shower MC model: ...
- The OOPDF project
- Unfolding platform: ...
- Fitting platform (?)
- Geant4 platform (?)
- SUSY / BSM parameter fitting tools:...
- ...

Concrete measures to be taken

Concrete measures concerning the organisation and structure to be taken are (unordered list):

- Creation of the possibility of dedicated experiment-specific work by Alliance personnel.
- Unification of the different seminars (Analysis Centre Seminar, VTI seminar) in one PAW-C seminar series.
- Creation of a weekly (!) “Physics at the Terascale” time slot for the whole Portfolio community for seminars, discussion events, small workshops etc.
- Establishing of a (bi)monthly workshop series from all parts of the Portfolio topic, thus turning DESY into a spot well-known for frequent intense and fruitful discussions.

- Provision of a sufficiently high number (4 per year) of “applied” DESY fellows for Analysis Centre tasks.
- More concrete and more dedicated DESY staff for conceptual / planning / structural / communicative work.
- Integration of positions created from Portfolio money with the activities in the centre. In order to achieve this, a default share of 30% of the position’s working time should be spent at DESY (alternatively at another Alliance institute that is not the home institute of the position).
- Creation of an attractive web site, technically and content-wise managed with high competence, with live-feeds from LHC results, LHC / experiment operation, lumi plots, up-to-date calendars, important news.
- Creation of an excellent seminar room with the best and latest technology for video conferencing etc. (keep in mind that the Alliance / Portfolio is a highly virtual structure which depends on the quality of the communication).
- Continuation of the strong secretarial support and extension of the dedicated web support.
- Further integration of the LHC-D working groups into the Alliance structures – make them “projects” under the roof of the centre.

Summary: What is new?

(Selling points for HGF):

- We are now in the “data exploitation” phase of the LHC. This means that we are no longer driven by long-term projects to set up the necessary structures and tools in the experiments; these are in place. We therefore do not intend to have global working groups (like MC etc.).
  Instead, we now have to be able to assist, to the best of our forces, the German institutes in their data analysis and interpretation needs. This is a highly volatile business, requiring flexible structures, the possibility of organising short-term resources and good connections into the community. On top of that, a few highly visible flagship projects with immediate or expected impact (for example mainstream MC generators) will be worked on, equipped with sufficient manpower to keep the promises.

- The past has shown that both the education events and the workshops held across all four research topics of the Alliance are extremely useful. We will therefore create a completely new “workshop centre” inside the Portfolio topic, hosted at DESY, which will centrally organise all relevant events and will, more importantly, create a stringent and comprehensive workshop programme for every year, in close coordination with the CERN and FNAL Physics Centres etc. By doing so, we will turn the Portfolio topic community into a central place in the international LHC discussions.

- One idea behind the Analysis Centre was to bring people together such that they can bundle their efforts and avoid overlap (“constant reinvention of the wheel”). With the LHC-D working groups in place and the old Alliance idea and structure accepted, this is basically achieved for the German community.
  The various LHC centres at CERN, DESY, Argonne, FNAL etc. play important roles in their respective communities both in the provision of resources (fellows, CPU, money) and in the shaping of ideas and discussions. It is therefore natural to move “one step up” and connect the various LHC centres or, in other words, the

various world regions represented by the various centres in order to achieve a better coordination of activities and knowledge.

Further issues

Further questions / points to be discussed:

- Access to data for theorists? (Point was raised in Dresden)
- Collaboration centre – NAF? How? On what?
- Analysis frameworks and tools as a topic? Or to experiment-specific?
- Flexibility with funding / positions – don’t fix all money at the beginning of the Portfolio funding period.
- Remove unnatural separation between centre and project board (also money-wise).
- Hold a yearly physics-centered workshop at DESY (a la JTERM @ FNAL) with wide support from the “big hosts” in the German community; establish it as the place to go (instead of typical annual meetings which probably nobody really wants).